THE AGB NEWSLETTER

An electronic publication dedicated to Asymptotic Giant Branch stars and related phenomena

Official publication of the IAU Working Group on Abundances in Red Giants

No. 246 — 3 January 2018

http://www.astro.keele.ac.uk/AGBnews

Editors: Jacco van Loon, Ambra Nanni and Albert Zijlstra

Editorial

Dear Colleagues,

Happy New Year! It is a pleasure to present you the 246$^{\rm th}$ issue of the AGB Newsletter.

Three reviews are well worth reading. One concerns the great contributions made by amateurs to our field of research.

Have a look at the announcements for meetings in Poland and Japan.

This month's 'Food for Thought' is meant to solicit suggestions for the front cover of the 250$^{\rm th}$ issue, due in May.

The next issue is planned to be distributed around the 1$^{\rm st}$ of February.

Editorially Yours,
Jacco van Loon, Ambra Nanni and Albert Zijlstra

Food for Thought

This month's thought-provoking statement is:

What is the most iconic ever picture, spectrum or graph of an AGB-related object or phenomenon?

Reactions to this statement or suggestions for next month's statement can be e-mailed to astro.agbnews@keele.ac.uk (please state whether you wish to remain anonymous)

Refereed Journal Papers

Carbon chemistry in IRC +10°216: infrared detection of diacetylene

J.P. Fonfría[1], *M. Agúndez*[1], *J. Cernicharo*[1], *M.J. Richter*[2] *and J.H. Lacy*[3]

[1]Molecular Astrophysics Group, Instituto de Ciencia de Materiales de Madrid, CSIC, C/ Sor Juana Inés de la Cruz, 3, Cantoblanco, 28049, Madrid, Spain

[2]Physics Dept. – UC Davis, One Shields Ave., Davis, CA 95616, USA

[3]Astronomy Dept., University of Texas, Austin, TX 78712, USA

We present the detection of C_4H_2 for first time in the envelope of the C-rich AGB star IRC +10°216 based on high spectral resolution mid-IR observations carried out with the Texas Échelon-cross-Échelle Spectrograph (TEXES) mounted on the Infrared Telescope Facility (IRTF). The obtained spectrum contains 24 narrow absorption features above the detection limit identified as lines of the ro-vibrational C_4H_2 band $\nu_6 + \nu_8(\sigma_u^+)$. The analysis of these lines through a ro-vibrational diagram indicates that the column density of C_4H_2 is $(2.4 \pm 1.5) \times 10^{+16}$ cm^{-2}. Diacetylene is distributed in two excitation populations accounting for 20 and 80% of the total column density and with rotational temperatures of 47 ± 7 and 420 ± 120 K, respectively. This two-folded rotational temperature suggests that the absorbing gas is located beyond $\simeq 0''.4 \simeq 20$ R$_\star$ from the star with a noticeable cold contribution outwards from $\simeq 10 \simeq 500$ R$_\star$. This outer shell matches up with the place where cyanoacetylenes and carbon chains are known to form due to the action of the Galactic dissociating radiation field on the neutral gas coming from the inner layers of the envelope.

Accepted for publication in ApJ
Available from https://arxiv.org/abs/1711.10926

The close circumstellar environment of Betelgeuse – V. Rotation velocity and molecular envelope properties from ALMA

Pierre Kervella[1,2], *Leen Decin*[3], *Anita M.S. Richards*[4], *Graham M. Harper*[5], *Iain McDonald*[4], *Eamon O'Gorman*[6], *Miguel Montargès*[3], *Ward Homan*[3] *and Keiichi Ohnaka*[7]

[1]UMI LFCA, CNRS & Universidad de Chile, Chile

[2]LESIA, Observatoire de Paris, France

[3]K.U. Leuven, Belgium

[4]University of Manchester, UK

[5]University of Colorado, USA

[6]Dublin Institute for Advanced Studies, Ireland

[7]Universidad Católica del Norte, Chile

We observed Betelgeuse using ALMA's extended configuration in band 7 ($f \sim 340$ GHz, $\lambda \sim 0.88$ mm), resulting in a very high angular resolution of 18 mas. Using a solid body rotation model of the ^{28}SiO($v = 2, J = 8$–7) line emission, we show that the supergiant is rotating with a projected equatorial velocity of $v_{\rm eq} \sin i = 5.47 \pm 0.25$ km s^{-1} at the equivalent continuum angular radius $R_\star = 29.50 \pm 0.14$ mas. This corresponds to an angular rotation velocity of $\omega \sin i = (5.6 \pm 1.3) \times 10^{-9}$ rad s^{-1}. The position angle of its north pole is $PA = 48°.0 \pm 3°.5$. The rotation period of Betelgeuse is estimated to $P/\sin i = 36 \pm 8$ yr. The combination of our velocity measurement with previous observations in the ultraviolet shows that the chromosphere is co-rotating with the star up to a radius of ≈ 10 au (45 mas or 1.5× the ALMA continuum radius). The coincidence of the position angle of the polar axis of Betelgeuse with that of the major ALMA continuum hot spot, a molecular plume, and a partial dust shell (from previous observations) suggests that focused mass loss is currently taking place in the polar region of the star. We propose that this hot spot corresponds to the location of a particularly strong "rogue" convection cell, which emits a focused molecular plume that subsequently condenses into dust at a few stellar radii. Rogue convection cells therefore appear to be an

important factor shaping the anisotropic mass loss of red supergiants.

Accepted for publication in Astronomy & Astrophysics
Available from https://arxiv.org/abs/1711.07983

An infrared study of the circumstellar material associated with the carbon star R Sculptoris

Matthew J. Hankins[1], *Terry L. Herter*[1], *Matthias Maercker*[2], *Ryan M. Lau*[3] *and Gregory C. Sloan*[4,5]

[1]Cornell University, USA
[2]Chalmers University of Technology, Sweden
[3]Caltech, USA
[4]UNC Chapel Hill, USA
[5]STScI, USA

The asymptotic giant branch (AGB) star R Sculptoris (R Scl) is one of the most extensively studied stars on the AGB. R Scl is a carbon star with a massive circumstellar shell ($M_{\rm shell} \sim 7.3 \times 10^{-3}$ M$_\odot$) which is thought to have been produced during a thermal pulse event $\sim$ 2200 yr ago. To study the thermal dust emission associated with its circumstellar material, observations were taken with the Faint Object InfraRed CAMera for the SOFIA Telescope (FORCAST) at 19.7, 25.2, 31.5, 34.8, and 37.1 μm. Maps of the infrared emission at these wavelengths were used to study the morphology and temperature structure of the spatially extended dust emission. Using the radiative transfer code DUSTY and fitting the spatial profile of the emission, we find that a geometrically thin dust shell cannot reproduce the observed spatially resolved emission. Instead, a second dust component in addition to the shell is needed to reproduce the observed emission. This component, which lies interior to the dust shell, traces the circumstellar envelope of R Scl. It is best fit by a density profile with $n \propto r^{\alpha}$ where $\alpha = 0.75^{+0.45}_{-0.25}$ and dust mass of $M_{\rm d} = 9.0^{+2.3}_{-4.1} \times 10^{-6}$ M$_\odot$. The strong departure from an r^{-2} law indicates that the mass-loss rate of R Scl has not been constant. This result is consistent with a slow decline in the post-pulse mass-loss which has been inferred from observations of the molecular gas.

Accepted for publication in ApJ
Available from https://arxiv.org/abs/1712.02338

To the problem of spectral mimicry of supergiants

V.G. Klochkova[1] *and E.L. Chentsov*[1]

[1]Special Astrophysical Observatory RAS, Nizhnij Arkhyz, 369167 Russia

The phenomenon of spectral mimicry refers to the fact that hypergiants and post-AGB supergiants – stars of different masses in fundamentally different stages of their evolution have similar optical spectra, and also share certain other characteristics (unstable and extended atmospheres, expanding gas-dust envelopes, high IR excesses). As a consequence, it is not always possible to distinguish post-AGB stars from hypergiants based on individual spectral observations in the optical range. Examples of spectral mimicry are presentes using uniform, high-quality spectral material obtained on the 6-m telescope of the Special Astrophysical Observatory in the course of long-term monitoring of high-luminosity stars. It is shown that unambiguously resolving the mimicry problem for individual stars requires the determination of a whole set of parameters: luminosity, wind parameters, spectral energy distribution, the abundances of chemical elements in the atmosphere, spectral features, velocity field in the atmosphere and circumstellar medium, and behavior of the parameters with time.

Accepted for publication in Astronomy Report (2018)
Available from https://arxiv.org/abs/1711.11251

Chemical abundances of planetary nebulæ in the substructures of M 31 – II. The extended sample and a comparison study with the outer-disk group

Xuan Fang[1,2], *Rubén García-Benito*[3], *Martin A. Guerrero*[3], *Yong Zhang*[1,4,5], *Xiaowei Liu*[6,7,8], *Christophe Morisset*[9], *Amanda I. Karakas*[10], *Marcelo M. Miller Bertolami*[11], *Haibo Yuan*[12] *and Antonio Cabrera-Lavers*[13,14]

[1]Laboratory for Space Research, Faculty of Science, University of Hong Kong, Pokfulam Road, Hong Kong, China

[2]Department of Earth Sciences, Faculty of Science, University of Hong Kong, Pokfulam Road, Hong Kong, China

[3]Instituto de Astrofísica de Andalucía (IAA–CSIC), Glorieta de la Astronomía s/n, E-18008 Granada, Spain

[4]Department of Physics, Faculty of Science, University of Hong Kong, Pokfulam Road, Hong Kong, China

[5]School of Physics and Astronomy, Sun Yat-Sen University, Zhuhai 519082, China

[6]South-Western Institute for Astronomy Research, Yunnan University, Kunming 650500, China

[7]Department of Astronomy, School of Physics, Peking University, Beijing 100871, China

[8]Kavli Institute for Astronomy and Astrophysics, Peking University, Beijing 100871, China

[9]Instituto de Astronomía, Universidad Nacional Autónoma de México, Apdo. Postal 70264, México CDMX 04510, México

[10]Monash Centre for Astrophysics, School of Physics and Astronomy, Monash University, VIC 3800, Australia

[11]Instituto de Astrofísica de La Plata, UNLP–CONICET, Paseo del Bosque s/n, 1900 La Plata, Argentina

[12]Department of Astronomy, Beijing Normal University, Beijing 100875, China

[13]GRANTECAN, Cuesta de San José s/n, E-38712, Breña Baja, La Palma, Spain

[14]Instituto de Astrofísica de Canarias, Vía Láctea s/n, La Laguna, E-38205 Tenerife, Spain

We report deep spectroscopy of ten planetary nebulæ (PNe) in the Andromeda Galaxy (M 31) using the 10.4-m GTC. Our targets reside in different regions of M 31, including halo streams and dwarf satellite M 32, and kinematically deviate from the extended disk. The temperature-sensitive [O iiiI] 4363 line is observed in all targets. For four PNe, the GTC spectra extend beyond 1 μm, enabling explicit detection of the [S iii] 6312 and 9069,9531 lines and thus determination of the [S sc iii] temperature. Abundance ratios are derived and generally consistent with AGB model predictions. Our PNe probably all evolved from low-mass (< 2 $M_{\odot}$) stars, as analyzed with the most up-to-date post-AGB evolutionary models, and their main-sequence ages are mostly $\sim$ 2–5 Gyr. Compared to the underlying, smooth, metal-poor halo of M 31, our targets are uniformly metal-rich ([O/H] $\gtrsim -0.4$), and seem to resemble the younger population in the stream. We thus speculate that our halo PNe formed in the Giant Stream's progenitor through extended star formation. Alternatively, they might have formed from the same metal-rich gas as did the outer-disk PNe, but was displaced into their present locations as a result of galactic interactions. These interpretations are, although speculative, qualitatively in line with the current picture, as inferred from previous wide-field photometric surveys, that M 31's halo is the result of complex interactions and merger processes. The behavior of N/O of the combined sample of the outer-disk and our halo/substructure PNe signifies that hot bottom burning might actually occur at < 3 $M_{\odot}$, but careful assessment is needed.

Accepted for publication in The Astrophysical Journal

Seismic probing of the first dredge-up event through the eccentric red-giant/red-giant spectroscopic binary KIC 9163796

P.G. Beck[1,2,3,4], *T. Kallinger*[5], *K. Pavlovski*[6], *A. Palacios*[7], *A. Tkachenko*[8], *S. Mathis*[3,4,9], *R.A. García*[3,4], *E. Corsaro*[1,2,3,4], *C. Johnston*[8], *B. Mosser*[9], *T. Ceillier*[3,4], *J.-D. do Nascimento Jr.*[10,11] *and G. Raskin*[8]

[1]Instituto de Astrofísica de Canarias, E-38200 La Laguna, Tenerife, Spain

[2]Departamento de Astrofísica, Universidad de La Laguna, E-38206 La Laguna, Tenerife, Spain

[3]IRFU, CEA, Université Paris-Saclay, F-91191 Gif-sur-Yvette, France

[4]Université Paris Diderot, AIM, Sorbonne Paris Cité, CEA, CNRS, F-91191 Gif-sur-Yvette, France

[5]Institut für Astronomie der Universität Wien, Türkenschanzstr. 17, 1180 Wien, Austria

[6]Department of Physics, Faculty of Science, University of Zagreb, Croatia

[7]LUPM, UMR5299, Université de Montpellier, CNRS, F-34095 Montpellier cedex 5, France

[8]Instituut voor Sterrenkunde, K.U. Leuven, 3001 Leuven, Belgium

[9]LESIA, Obs. de Paris, PSL Research Univ., CNRS, Univ. Pierre et Marie Curie, Univ. Paris Diderot, 92195 Meudon, France

[10]Harvard–Smithsonian Center for Astrophysics, Cambridge, MA 02138, USA

[11]Departamento de Física, Universidade Federal do Rio Grande do Norte, CEP: 59072-970 Natal, RN, Brazil

Binaries in double-lined spectroscopic systems provide a homogeneous set of stars. Differences of parameters, such as age or initial conditions, which otherwise would have strong impact on the stellar evolution, can be neglected. The observed differences are determined by the difference in stellar mass between the two components. The mass ratio can be determined with much higher accuracy than the actual stellar mass. In this work, we aim to study the eccentric binary system KIC 9163796, whose two components are very close in mass and both are low-luminosity red-giant stars from four years of *Kepler* space photometry and high-resolution spectroscopy with *Hermes*. Mass and radius of the primary were determined through asteroseismology to be 1.39 ± 0.06 M$_\odot$ and 5.35 ± 0.09 R$_\odot$, resp. From spectral disentangling the mass ratio was found to be 1.015 ± 0.005 and that the secondary is ~ 600 K hotter than the primary. Evolutionary models place both components, in the early and advanced stage of the first dredge-up event on the red-giant branch. From theoretical models of the primary, we derived the internal rotational gradient. From a grid of models, the measured difference in lithium abundance is compared with theoretical predictions. The surface rotation of the primary is determined from the *Kepler* light curve and resembles the orbital period within 10 days. The radial rotational gradient between the surface and core is found to be $6.9^{+2.0}_{-1.0}$. The agreement between the surface rotation with the seismic result indicates that the full convective envelope is rotating quasi-rigidly. The models of the lithium abundance are compatible with a rigid rotation in the radiative zone during the main sequence. Because of the many constraints offered by oscillating stars in binary systems, such objects are important test beds of stellar evolution.

Accepted for publication in A&A
Available from https://arxiv.org/abs/1712.05208

Infrared spectroscopy of the remnant of Nova Sco 2014: a symbiotic star with too little circumstellar matter to decelerate the ejecta

U. Munari[1] *and D. Banerjee*[2]

[1]INAF – Astronomical Observatory of Padova, 36012 Asiago (VI), Italy

[2]Physical Research Laboratory, Navrangpura, Ahmedabad, Gujarat 380009, India

Pre-outburst 2MASS and WISE photometry of Nova Sco 2014 (V1534 Sco) have suggested the presence of a cool giant at the location of the nova in the sky. The spectral evolution recorded for the nova did not however support a direct partnership because no flash-ionized wind and no deceleration of the ejecta were observed, contrary to the behavior displayed by other novae which erupted within symbiotic binaries like V407 Cyg or RS Oph. We have therefore obtained an 0.8–2.5-μm spectra of the remnant of Nova Sco 2014 in order to ascertain if a cool giant is indeed present and if it is physically associated with the nova. The spectrum shows the presence of a M6III giant, reddened by $E(B-V) = 1.20$ mag, displaying the typical and narrow emission-line spectrum of a symbiotic star, including He I 1.0830 μm with a deep P Cyg profile. This makes Nova Sco 2014 a new member of the exclusive club of novae that erupt within a symbiotic binary. Nova Sco 2014 shows that a nova erupting witin a symbiotic binary does not always come with a

deceleration of the ejecta, contrary to the common belief. Many other similar systems may lay hidden in past novae, especially in those that erupted prior to the release of the 2MASS all-sky infrared survey, which could be profitably cross-matched now against them.

Accepted for publication in MNRAS

A view of the H-band light-element chemical patterns in globular clusters under the AGB self-enrichment scenario

F. Dell'Agli[1,2], *D.A. García-Hernández*[1,2], *P. Ventura*[3], *S. Mészáros*[4,5], *T. Masseron*[1,2], *J.G. Fernández-Trincado*[6,7], *B. Tang*[6], *M. Shetrone*[8], *O. Zamora*[1,2] *and S. Lucatello*[9]

[1]Instituto de Astrofísica de Canarias, Vía Láctea s/n, E-38205 La Laguna, Tenerife, Spain

[2]Departamento de Astrofísica, Universidad de La Laguna (ULL), E-38206 La Laguna, Spain

[3]INAF – Osservatorio Astronomico di Roma, Via Frascati 33, 00040, Monte Porzio Catone (RM), Italy

[4]ELTE Eötvös Loránd University, Gothard Astrophysical Observatory, Szombathely, Hungary

[5]Premium Postdoctoral Fellow of the Hungarian Academy of Sciences

[6]Departamento de Astronomía, Casilla 160-C, Universidad de Concepción, Concepción, Chile

[7]Institut Utinam, CNRS UMR6213, Univ. Bourgogne Franche-Comté, OSU THETA, Observatoire de Besançon, BP 1615, 25010 Besançon Cedex, France

[8]University of Texas at Austin, McDonald Observatory, Fort Davis, TX 79734, USA

[9]INAF – Osservatorio Astronomico di Padova, vicolo dell'Osservatorio 5, I-35122 Padova, Italy

We discuss the self-enrichment scenario by AGB stars for the formation of multiple populations in globular clusters (GCs) by analyzing data set of giant stars observed in 9 Galactic GCs, covering a wide range of metallicities and for which the simultaneous measurements of C, N, O, Mg, Al, Si are available. To this aim we calculated 6 sets of AGB models, with the same chemical composition as the stars belonging to the first generation of each GC. We find that the AGB yields can reproduce the set of observations available, not only in terms of the degree of contamination shown by stars in each GC but, more important, also the observed trend with metallicity, which agrees well with the predictions from AGB evolution modelling. While further observational evidences are required to definitively fix the main actors in the pollution of the interstellar medium from which new generation of stars formed in GCs, the present results confirm that the gas ejected by stars of mass in the range $4 \leq M(\mathrm{M}_\odot) \leq 8$ during the AGB phase share the same chemical patterns traced by stars in GCs.

Accepted for publication in MNRAS
Available from https://arxiv.org/abs/1712.04500

IFU spectroscopy of southern PN – VI: The extraordinary chemo-dynamics of Hen 2-111

M.A. Dopita,[1], *A. Ali*[2,5], *A.I. Karakas*[3], *D. Goldman*[4], *M.A. Amer*[5,2] *and R.S. Sutherland*[1]

[1]Research School of Astronomy and Astrophysics, Australian National University, Cotter Rd., Weston ACT 2611, Australia

[2]Department of Astronomy, Faculty of Science, Cairo University, Egypt

[3]Monash Centre for Astrophysics, School of Physics and Astronomy, Monash University, Victoria 3800, Australia

[4]Astrodon Imaging, Roseville, CA 95661, USA

[5]Astronomy Dept., Faculty of Science, King Abdulaziz University, Jeddah, Saudi Arabia

In this paper we present integral field spectroscopy of the extraordinary Type I bipolar planetary nebula Hen 2-111. In the lobes we map fast moving knots of material with [N II]λ6584/Hα ratios up to 12, and with radial velocities relative to systemic from -340 km s^{-1} up to $+390$ km s^{-1}. We find evidence of a bipolar ejection event at a velocity ~ 600 km s^{-1} from the central star (assumed to be a binary), which occurred about 8000 yr ago. The fast moving material is chemically quite distinct from the lower velocity gas in the bipolar lobes., and displays very high N abundances. We show that the fast moving N-rich knots are not photo-ionised by the central star, and have constructed detailed shock models for the brightest knot. We find a pre-shock density ~ 6 cm^{-3}, and a shock velocity ~ 150 km/ .$^{-1}$The

shock is not fully radiative, being only ~ 600 yr old. This shocked gas is partially H-burnt, with a helium abundance by mass exceeding that of hydrogen, and is interacting with partially H-burnt material ejected in an earlier episode of mass loss. We conclude that the high-velocity material and the bipolar shell must have originated during the late stages of evolution of a common-envelope phase in a close binary system.

Accepted for publication in MNRAS
Available from https://arxiv.org/abs/1712.01474

Equilibrium chemistry down to 100 K – Impact of silicates and phyllosilicates on carbon/oxygen ratio

P. Woitke[1], Ch. Helling[1], G.H. Hunter[1], J.D. Millard[1], G.E. Turner[1], M. Worters[1], J. Blecic[2] and J.W. Stock[3]

[1]SUPA School of Physics & Astronomy, University of St. Andrews, North Haugh, KY16 9SS, St. Andrews, UK

[2]New York University Abu Dhabi, Abu Dhabi, United Arab Emirates

[3]Department of Chemistry and Environmental Science, Medgar Evers College-City University of New York, 1650 Bedford Avenue, Brooklyn, NY 11235, USA

We introduce a fast and versatile computer code, GGchem, to determine the chemical composition of gases in thermo-chemical equilibrium down to 100 K, with or without equilibrium condensation. We review the data for molecular equilibrium constants, $k_P(T)$, from several sources and discuss which functional fits are most suitable for low temperatures. We benchmark our results against another chemical equilibrium code. We collect Gibbs free energies, $\Delta G(T)$, for about 200 solid and liquid species from the NIST–JANAF database and the geophysical database SUPCRTBL. We discuss the condensation sequence of the elements with solar abundances in phase equilibrium down to 100 K. Once the major magnesium silicates Mg_2SiO_4[s] and $MgSiO_3$[s] have formed, the dust/gas mass ratio jumps to a value of about 0.0045 which is significantly lower than the often assumed value of 0.01. Silicate condensation is found to increase the carbon/oxygen ratio (C/O) in the gas from its solar value of ~ 0.55 up to ~ 0.71, and, by the additional intake of water and hydroxyl into the solid matrix, the formation of phyllosilicates at temperatures below ~ 400 K increases the gaseous C/O further to about 0.83. Metallic tungsten (W) is the first condensate found to become thermodynamically stable around 1600–2200 K (depending on pressure), several hundreds of Kelvin before subsequent materials like zirconium dioxide (ZrO_2) or corundum (Al_2O_3) can condense. We briefly discuss whether tungsten, despite its low abundance of $\sim 2 \times 10^{-7}$ times the silicon abundance, could provide the first seed particles for astrophysical dust formation. The GGchem code is publicly available at https://github.com/pw31/GGchem.

Accepted for publication in Astronomy and Astrophysics
Available from https://arxiv.org/abs/1712.01010

AGB subpopulations in the nearby globular cluster NGC 6397

B.T. MacLean[1], S.W. Campbell[1,2], G.M. De Silva[3,4], J. Lattanzio[1], V. D'Orazi[7,5,6], P.L. Cottrell[1,8], Y. Momany[7] and L. Casagrande[9]

[1]Monash Centre for Astrophysics, School of Physics and Astronomy, Monash University, Victoria 3800, Australia

[2]Max-Planck-Institut für Astrophysik (MPA), Karl-Schwarzschild-Straße 1, D-85741 Garching bei München, Germany

[3]Australian Astronomical Observatory, 105 Delhi Rd., North Ryde, NSW 2113, Australia

[4]Sydney Institute for Astronomy, School of Physics, The University of Sydney, NSW 2006, Australia

[5]Research Centre for Astronomy, Astrophysics & Astrophotonics (MQAAAstro), Macquarie University, Sydney, NSW 2109, Australia

[6]Department of Physics and Astronomy, Macquarie University, North Ryde, NSW 2109, Australia

[7]INAF – Osservatorio Astronomico di Padova, vicolo dell'Osservatorio 5, I-35122, Padova, Italy

[8]School of Physical and Chemical Sciences, University of Canterbury, Private Bag 4800, Christchurch 8140, New Zealand

[9]Research School of Astronomy and Astrophysics, Australian National University, Canberra, ACT 2611, Australia

It has been well established that Galactic globular clusters (GCs) harbour more than one stellar population, distinguishable by the anti-correlations of light element abundances (C–N, Na–O, and Mg–Al). These studies have been extended recently to the asymptotic giant branch (AGB). Here we investigate the AGB of NGC 6397 for the first time.

We have performed an abundance analysis of high-resolution spectra of 47 RGB and 8 AGB stars, deriving Fe, Na, O, Mg and Al abundances. We find that NGC 6397 shows no evidence of a deficit in Na-rich AGB stars, as reported for some other GCs – the subpopulation ratios of the AGB and RGB in NGC 6397 are identical, within uncertainties. This agrees with expectations from stellar theory. This GC acts as a control for our earlier work on the AGB of M 4 (with contrasting results), since the same tools and methods were used.

Accepted for publication in MNRAS
Available from https://arxiv.org/abs/1712.03340

Probing the baryon cycle of galaxies with SPICA mid- and far-infrared observations

F.F.S. van der Tak[1]*, S.C. Madden, P. Roelfsema, L. Armus, M. Baes, J. Bernard-Salas, A. Bolatto, S. Bontemps, C. Bot, C.M. Bradford, J. Braine, L. Ciesla, D. Clements, D. Cormier, J.A. Fernández-Ontiveros, F. Galliano, M. Giard, H. Gomez, E. González-Alfonso, F. Herpin, D. Johnstone, A. Jones, H. Kaneda, F. Kemper, V. Lebouteiller, I. De Looze, M. Matsuura, T. Nakagawa, T. Onaka, P. Pérez-González, R. Shipman and L. Spinoglio*[2]

[1]SRON – Groningen, The Netherlands

[2]25 other institutions

The SPICA mid and far-infrared telescope will address fundamental issues in our understanding of star formation and ISM physics in galaxies. A particular hallmark of SPICA is the outstanding sensitivity enabled by the cold telescope, optimized detectors, and wide instantaneous bandwidth throughout the mid- and far-infrared. The spectroscopic, imaging and polarimetric observations that SPICA will be able to collect will help in clarifying the complex physical mechanisms which underlie the baryon cycle of galaxies. In particular: (i) The access to a large suite of atomic and ionic fine-structure lines for large samples of galaxies will shed light on the origin of the observed spread in star formation rates within and between galaxies. (ii) Observations of HD rotational lines (out to $\sim$ 10 Mpc) and fine structure lines such as [C II] 158 μm (out to $\sim$ 100 Mpc) will clarify the main reservoirs of interstellar matter in galaxies, including phases where CO does not emit. (iii) Far-infrared spectroscopy of dust and ice features will address uncertainties in the mass and composition of dust in galaxies, and the contributions of supernovæ to the interstellar dust budget will be quantified by photometry and monitoring of supernova remnants in nearby galaxies. (iv) Observations of far-infrared cooling lines such as [O I] 63 μm from star-forming molecular clouds in our Galaxy will evaluate the importance of shocks to dissipate turbulent energy. The paper concludes with requirements for the telescope and instruments, and recommendations for the observing strategy.

Accepted for publication in PASA (special issue about the SPICA mission)
Available from https://arxiv.org/abs/1711.11327

Astrophysical S-factor of the ^{14}N(p,γ)^{15}O reaction at 0.4–1.3 MeV

L. Wagner[1,2]*, S. Akhmadaliev*[1]*, M. Anders*[1,2]*, D. Bemmerer*[1]*, A. Caciolli*[3,4]*, St. Gohl*[1,2]*, M. Grieger*[1,2]*, A. Junghans*[1]*, M. Marta*[6]*, F. Munnik*[1]*, T.P. Reinhardt*[1,2]*, S. Reinicke*[1,2]*, M. Röder*[1,2]*, K. Schmidt*[1,2]*, R. Schwengner*[1]*, M. Serfling*[1,2]*, M.P. Takács*[1,2]*, T. Szücs*[1]*, A. Vomiero*[5]*, A. Wagner*[1] *and K. Zuber*[2]

[1]Helmholtz Zentrum Dresden–Rossendorf (HZDR), 01328 Dresden, Germany

[2]Technische Universität Dresden, 01069 Dresden, Germany

[3]Dipartimento di Fisica e Astronomia, Università degli studi di Padova, 35131 Padova, Italy

[4]Istituto Nazionale di Fisica Nucleare (INFN), Sezione di Padova, 35131 Padova, Italy

[5]Department of Engineering Sciences and Mathematics, Luleå University of Technology, 97187 Luleå, Sweden

[6]GSI Helmholtzzentrum für Schwerionenforschung, D-64291 Darmstadt, Germany

The ^{14}N(p,γ)^{15}O reaction is the slowest reaction of the carbon–nitrogen cycle of hydrogen burning and thus determines

its rate. The precise knowledge of its rate is required to correctly model hydrogen burning in asymptotic giant branch stars. In addition, it is a necessary ingredient for a possible solution of the solar abundance problem by using the solar ^{13}N and ^{15}O neutrino fluxes as probes of the carbon and nitrogen abundances in the solar core. After the downward revision of its cross section due to a much lower contribution by one particular transition, capture to the ground state in ^{15}O, the evaluated total uncertainty is still 8%, in part due to an unsatisfactory knowledge of the excitation function over a wide energy range. The present work reports precise S-factor data at twelve energies between 0.357–1.292 MeV for the strongest transition, capture to the 6.79 MeV excited state in ^{15}O, and at ten energies between 0.479–1.202 MeV for the second strongest transition, capture to the ground state in ^{15}O. A tentative R-matrix fit is performed to gauge the impact of the new data on astrophysical energies. The recently suggested slight enhancement of the 6.79 MeV transition at low energy could not be confirmed. The present extrapolated zero-energy S-factors are $S_{6.79}(0) = 1.24 \pm 0.11$ keV barn and $S_{\mathrm{GS}}(0) = 0.19 \pm 0.05$ keV barn.

Accepted for publication in PRC
Available from https://arxiv.org/abs/1711.10847

Neon, sulphur and argon abundances of planetary nebulæ in the sub-solar metallicity Galactic anti-centre

George J.S. Pagomenos[1], *Jeronimo Bernard-Salas*[1] *and Stuart R. Pottasch*[2]

[1]The Open University, School of Physical Sciences, Walton Hall, Milton Keynes, UK
[2]Kapteyn Astronomical Institute, Groningen, The Netherlands

Spectra of planetary nebulæ show numerous fine structure emission lines from ionic species, enabling us to study the overall abundances of the nebular material that is ejected into the interstellar medium. The abundances derived from planetary nebula emission show the presence of a metallicity gradient within the disk of the Milky Way up to Galactocentric distances of ~ 10 kpc, which are consistent with findings from studies of different types of sources, including H II regions and young B-type stars. The radial dependence of these abundances further from the Galactic centre is in dispute. We aim to derive the abundances of neon, sulphur and argon from a sample of planetary nebulæ towards the Galactic anticentre, which represent the abundances of the clouds from which they were formed, as they remain unchanged throughout the course of stellar evolution. We then aim to compare these values with similarly analysed data from elsewhere in the Milky Way in order to observe whether the abundance gradient continues in the outskirts of our Galaxy. We have observed 23 planetary nebulæ at Galactocentric distances of 8–21 kpc with *Spitzer* IRS. The abundances were calculated from infrared emission lines, for which we observed the main ionisation states of neon, sulphur, and argon, which are little affected by extinction and uncertainties in temperature measurements or fluctuations within the planetary nebula. We have complemented these observations with others from optical studies in the literature, in order to reduce or avoid the need for ionisation correction factors in abundance calculations. The overall abundances of our sample of planetary nebulæ in the Galactic anti-centre are lower than those in the solar neighbourhood. The abundances of neon, sulphur, and argon from these stars are consistent with a metallicity gradient from the solar neighbourhood up to Galactocentric distances of ~ 20 kpc, albeit with varying degrees of dispersion within the data.

Accepted for publication in A&A
Available from https://arxiv.org/abs/1712.08827

Conference Papers

SWAG water masers in the Galactic Center

Jürgen Ott[1], Nico Krieger[2], Matthew Rickert[3], David Meier[4,1], Adam Ginsburg[1] and Farhad Yusef-Zadeh[3]

[1]National Radio Astronomy Observatory, 1003 Lopezville Road, Socorro, NM 87801, USA

[2]Max-Planck-Institut für Astronomie, Königstuhl 17, 69120 Heidelberg, Germany

[3]Department of Physics and Astronomy and CIERA, Northwestern University, Evanston, IL 60208, USA

[4]New Mexico Institute of Mining and Technology, 801 Leroy Place, Socorro, NM 87801, USA

The Galactic Center contains large amounts of molecular and ionized gas as well as a plethora of energetic objects. Water masers are an extinction-insensitive probe for star formation and thus ideal for studies of star formation stages in this highly obscured region. With the Australia Telescope Compact Array, we observed 22-GHz water masers in the entire Central Molecular Zone with sub-parsec resolution as part of the large SWAG survey: "Survey of Water and Ammonia in the Galactic Center". We detect of order 600 22-GHz masers with isotropic luminosities down to $\sim 10^{-7}$ $L_\odot$. Masers with luminosities of $\gtrsim 10^{-6}$ $L_\odot$ are likely associated with young stellar objects. They appear to be close to molecular gas streamers and may be due to star formation events that are triggered at pericenter passages near Sgr A*. Weaker masers are more widely distributed and frequently show double line features, a tell-tale sign for an origin in evolved star envelopes.

Oral contribution, published in IAU Symposium No. 336, "Astrophysical Masers: Unlocking the Mysteries of the Universe"

Available from https://arxiv.org/abs/1711.01723

Hubble Catalog of Variables

M. Yang[1], A.Z. Bonanos[1], P. Gavras[1], K. Sokolovsky[1,2,3], D. Hatzidimitriou[1,4], M.I. Moretti[5], A. Karampelas[1], I. Bellas-Velidis[1], Z. Spetsieri[1,4], E. Pouliasis[1,4], I. Georgantopoulos[1], V. Charmandaris[1], K. Tsinganos[1], N. Laskaris[6], G. Kakaletris[6], A. Nota[7,8], D. Lennon[9], C. Arviset[9], B. Whitmore[7], T. Budavari[10], R. Downes[7], S. Lubow[7], A. Rest[7], L. Strolger[7] and R. White[7]

[1]IAASARS, National Observatory of Athens, Penteli 15236, Greece

[2]Astro Space Center of Lebedev Physics Institute, Moscow 117997, Russia

[3]Sternberg Astronomical Institute, Moscow State University, Moscow 119992, Russia

[4]Department of Physics, National and Kapodistrian University of Athens, Ilissia 15771, Greece

[5]INAF–Osservatorio Astronomico di Capodimonte, Napoli 80131, Italy

[6]Athena Research and Innovation Center, Maroussi 15125, Greece

[7]Space Telescope Science Institute, Baltimore, MD 21218, USA

[8]European Space Agency, Research and Scientific Support Department, Baltimore, MD 21218, USA

[9]European Space Astronomy Centre, Madrid 28692, Spain

[10]The Johns Hopkins University, Baltimore, MD 21218, USA

The *Hubble* Catalog of Variables (HCV) project aims to identify the variable sources in the *Hubble* Source Catalog (HSC), which includes about 92 million objects with over 300 million measurements detected by the WFPC2, ACS and WFC3 cameras on board of the *Hubble* Space Telescope (HST), by using an automated pipeline containing a set of detection and validation algorithms. All the HSC sources with more than a predefined number of measurements in a single filter/instrument combination are pre-processed to correct systematic effect and to remove the bad measurements. The corrected data are used to compute a number of variability indexes to determine the variability status of each source. The final variable source catalog will contain variables stars, active galactic nuclei (AGNs), supernovæ (SNs) or even new types of variables, reaching an unprecedented depth ($V \leq 27$ mag). At the end of the project, the first release of the HCV will be available at the *Mikulski* Archive for Space Telescopes (MAST) and the ESA *Hubble* Science Archives. The HCV pipeline will be deployed at the Space Telescope Science Institute (STScI) so that an updated HCV may be generated following future releases of HSC.

Oral contribution, published in "Stellar Populations and the Distance Scale (a conference in honour of Jeremy Mould)", 11–15 September 2017, Beijing, China

Available from https://arxiv.org/abs/1711.11491

Review Papers

Multiple stellar populations in globular clusters

Nate Bastian[1] *and Carmela Lardo*[1,2]

[1]LJMU, UK
[2]Lausanne Observatoire, Switzerland

Globular Clusters (GCs) exhibit star-to-star variations in specific elements (e.g., He, C, N, O, Na, Al) that bare the hallmark of high temperature H burning. These abundance variations can be observed spectroscopically and also photometrically, with the appropriate choice of filters, due to the changing of spectral features within the band pass. This phenomenon is observed in nearly all of the ancient GCs, although, to date, has not been found in any massive cluster younger than 2 Gyr. Many scenarios have been suggested to explain this phenomenon, with most invoking multiple epochs of star-formation within the cluster, however all have failed to reproduce various key observations, in particular when a global view of the GC population is taken. We review the state of current observations, and outline the successes and failures of each of the main proposed models. The traditional idea of using the stellar ejecta from a 1st generation of stars to form a 2^{nd} generation of stars, while conceptually straight forward, has failed to reproduce an increasing number of observational constraints. We conclude that the puzzle of multiple populations remains unsolved, hence alternative theories are needed.

Published in Annual Reviews of Astronomy & Astrophysics
Available from https://arxiv.org/abs/1712.01286

Staying ahead of the curve: progress in British variable star astronomy

Jeremy Shears[1]

[1]British Astronomical Association, UK

The BAA Variable Star Section is the world's longest established organisation for the systematic observation of variable stars, having been formed in 1890. Its database contains nearly 3 million measurements going back to 1840 and is an important resource for researchers. The aim of this Presidential Address is to reveal some of the lesser known tales that lie deep within the database. This includes bringing to life stories about some of the people that were involved, especially in the early years, including Joseph Baxendell, Mary Adela Blagg and Arthur Stanley Williams, as well as shedding light on some of the stars that have been observed. Finally we look to the future as the Variable Star Section builds on the legacy of its forebears, ensuring that it shall always stay ahead of the curve.

Published in Journal of the British Astronomical Association
Available from https://arxiv.org/abs/1712.05399

Cosmic Dust IX

Hiroshi Kimura[1], *Ludmilla Kolokolova*[2], *Aigen Li*[3], *Hidehiro Kaneda*[4], *Jean-Charles Augereau*[5,6] *and Cornelia Jäger*[7]

[1]Planetary Exploration Research Center (PERC), Chiba Institute of Technology, Japan
[2]University of Maryland, USA
[3]University of Missouri, USA
[4]Nagoya University, Japan
[5]Université Grenoble Alpes, France
[6]CNRS, IPAG, France
[7]Max Planck Institute for Astronomy, Germany

It is a dusty universe. Every year, approximately 10^4 tons of cosmic dust enter Earth's atmosphere (Brownlee 1985).

These dust particles mostly originate from the breakup of comets and asteroids and sometimes are visible as meteors if they are greater than millimeters. Besides originating from comets and asteroids, interplanetary dust reveals itself through the zodiacal light, caused by sunlight scattered at the particles. The collisional breakup of asteroidal bodies and outgassing of cometary bodies are also considered as the major sources of dust particles in debris disks around main sequence (MS) stars, revealed through the detection of infrared (IR) emission and/or scattered optical/near-IR light. Known as protoplanetary disks, dusty disks are also seen in pre-MS Herbig Ae/Be stars and T Tauri stars. Moreover, dust is associated with stars in their late stages of evolution: dust grains condense in the atmospheres and blown out of cool evolved stars by radiation pressure; dust grains also condense in the cool ejecta of supernovae. Dust pervades the interstellar medium (ISM) of the Milky Way galaxy and external galaxies, both near and far. There is evidence for the presence of an obscuring dust torus around the central engine of active galactic nuclei (AGNs). Dust grains are also present in the intergalactic space.

It has long been recognized that dust is a ubiquitous feature of the cosmos, impinging directly or indirectly on most fields of modern astronomy. Aiming at providing a constructive forum for representatives of a variety of diverse fields in dust astrophysics to lively discuss their latest results in a cosy atmosphere, we have been organizing a series of cosmic dust meetings since 2006. The 9$^{\text{th}}$ meeting on this series (hereafter Cosmic Dust IX) was held at the Aoba Science Hall of Tohoku University in Sendai, Japan on August 15–19, 2016. It was attended by 51 participants from 12 countries.

The invited speakers, James M. Bauer (JPL, USA), Adwin Boogert (SOFIA Science Center, USA), Hiroki Chihara (Osaka Sangyo University, Japan), Frédéric Galliano (CEA/Saclay, France), Akiko M. Nakamura (Kobe University, Japan), Ann Nguyen (JETS/Jacobs Tech., USA), Ralf Siebenmorgen (ESO, Germany), Greg C. Sloan (Cornell University, USA), Philippe Thébault (LESIA, France), and Christopher M. Wright (UNSW ADFA, Australia), each presented a 40-minute talk. In addition, there were also 30 contributed talks of which each was assigned 20 minutes and 13 posters all of which were displayed throughout the entire 5-day meeting. The invited speakers ranked the posters and selected Takuma Kokusho (Nagoya University, Japan) and Ryo Tazaki (Kyoto University, Japan) as the laureates of the Best Poster Award for their posters "A systematic study on dust in early-type galaxies" and "Grain alignment in the protoplanetary disks", respectively. The invited talks, contributed talks, and posters covered a wide variety of topics, ranging from dust in the Solar System to dust in young stars, MS stars, and evolved stars as well as dust in the Galactic and extragalactic ISM and in AGNs.

This special issue in Planetary and Space Science (PSS) is a collection of (some of) the papers resulted from the meeting except for Pitman et al. (2017) and Rachid et al. (2017). It consists of 5 review articles and 7 original papers. Each paper was peer reviewed by two or more anonymous referees. We thank all the authors, referees and editors whose tireless efforts made it possible for this special issue to be a valuable source of dust research.

Published in Planetary and Space Science, 149, 1–4 (2017)
Available from https://arxiv.org/abs/1712.01984
and from https://doi.org/10.1016/j.pss.2017.11.006

Announcements

First announcement: ESO Workshop A revolution in stellar physics with Gaia and large surveys

Warsow, Poland
September 3–7, 2018
contact: revolution@camk.edu.pl

The workshop will focus on discussions about the advances in our understanding of stellar physical processes made possible by combining the exquisite astrometry and photometry of Gaia with data of other large photometric, spectroscopic, and asteroseismic stellar surveys. These combined data will permit detailed studies of stellar physics to a level that is unprecedented in the history of stellar astrophysics.

The second release (DR2) of Gaia data is planned for April 2018. With the DR2 data available, the workshop will be a perfect moment to showcase Gaia's synergy with other surveys, discuss early science achievements and future developments.

Topics to be addressed in the workshop include:

- Accuracy of stellar models
- Binaries and multiple stars
- Gaia and stellar physics
- Low- and high-mass stars
- Mixing processes
- Observational tests of stellar evolution
- Ongoing and future stellar surveys
- Stars in all evolutionary stages (pre-main sequence to white dwarf regime)
- Stellar ages
- Stellar clusters
- Stellar variability

Registration and abstract submission will open on January 3, 2018, with deadline April 15, 2018. More information on our website.

Confirmed Invited Speakers:

- Carine Babusiaux (Université Grenoble Alpes, France)
- Maria Bergemann (Max-Planck Institute for Astronomy, Germany)
- Corinne Charbonnel (Geneva Observatory, Switzerland)
- Kevin Covey (Western Washington University, USA)
- Laurent Eyer (University of Geneva, Switzerland)
- Gregory Feiden (University of North Georgia, USA)
- Boris Gänsicke (University of Warwick, UK)
- Léo Girardi (Padova Observatory, Italy)
- Lynne Hillenbrand (Caltech, USA)
- Daniel Huber (University of Hawai'i, USA)
- Amanda Karakas (Monash University, Australia)
- Andreas Korn (Uppsala University, Sweden)
- Igor Soszyński (University of Warsaw, Poland)
- Silvia Toonen (University of Amsterdam, Netherlands)

SOC: Sylvia Ekström (Geneva Observatory, Switzerland), Gerald Handler (CAMK, Poland), Gaitee Hussain (ESO Garching), Scilla Degl'Innocenti (University of Pisa, Italy), Rob Jeffries (Keele University, UK), Danny Lennon (ESA, Spain), Andrea Miglio (University of Birmingham, UK), Luca Pasquini (ESO Garching), Sofia Randich (INAF/Arcetri, Italy), Rodolfo Smiljanic (CAMK, Poland), Andrzej Udalski (University of Warsaw, Poland).

See also https://indico.camk.edu.pl/e/revolution

First Circular of Cosmic Dust XI

Monday August 13 – Friday August 17 , 2018
Sagamihara Campus of JAXA
Institute of Space and Astronautical Science
3-1-1 Yoshinodai, Chuo-ku
Sagamihara 252-5210
Japan

The campus is located in Sagamihara city, not far from Hakone at the foot of Mt. Fuji, and easy to access sightseeing places such as Yokohama and Kamakura, an ancient capital city.

OBJECTIVES:
This series of Cosmic Dust meetings aims at finding a consensus among experts on the formation and evolution of cosmic dust: where it comes from and where it goes. The meeting is organized by dust freaks who are very enthusiastic not only to make the goal achievable but also to establish a dust community across every scientifically relevant discipline for the development of cosmic dust research. For this reason, the primary objective of the meeting is to bring together professionals who deal with cosmic dust as well as provide an opportunity for participants to develop interpersonal relationships and scientific interactions among themselves.

SCOPE:
All kinds of cosmic dust such as

- intergalactic dust
- circumnuclear dust
- interstellar dust
- protoplanetary disk dust
- debris disk dust
- cometary dust
- interplanetary dust
- circumplanetary dust
- stellar nebular condensates
- presolar grains
- micrometeorites
- meteoroids
- meteors
- regolith particles

- planetary ærosols

are the subject of discussion. The meeting is open for any aspects of dust research by means of different methods of studies (in-situ and laboratory measurements, astronomical observations, laboratory and numerical simulations, theoretical modeling, data analyses, etc.). Also welcome are papers on dust-related topics, for example:

- the formation of molecules and their reactions on and their desorption from the surface of a solid substance
- light scattering by non-spherical particles and particulate surfaces
- space missions and instrumentation for measurements of particulates

ADMISSIONS APPLICATION:
Please complete online meeting application at the CPS website in order to attend the meeting. The deadline for the application is May 13, 2018, 11:59 p.m. Japan Standard Time (GMT+09:00). Because the number of participants is limited to a maximum of 50, the online application does not guarantee admission to the meeting. Participants will be determined at the discretion of the SOC and all applicants will be notified of the admissions decision by May 31, 2018. Priority will be given to those who contribute oral or poster sessions and retain enthusiasm for discussions throughout the meeting. For further details, please visit the Cosmic Dust website. https://www.cps-jp.org/ dust/Application.html

REGISTRATION FEE:
The early bird rate of 10,000 JPY is available for those who complete both admissions application and abstract submission by April 30, 2018. The registration fee for those who complete admissions application on and after May 1, 2018 is 15,000 JPY. While no payment is required at the time of admissions application and abstract submission, the registration fee should be paid by cash on arrival at the venue. No matter what circumstances are specified, the registration fee will not be waived.

BEST POSTER AWARD:
The best poster award will be given to the most excellent content and presentation of a poster at the Cosmic Dust meeting, although higher priorities are given to posters by students and junior scientists. The award winner will be announced in the closing minutes of the meeting.

PROCEEDINGS:
The proceedings of the meeting is planned to be published as a special issue of original papers (or in exceptional cases, review articles from invited speakers) in a peer-reviewed journal. All participants are strongly encouraged to publish a paper in this special issue of the journal, although paper submission to the proceedings is not obligatory. In recent years, the proceedings were published in Planetary and Space Science:
http://www.sciencedirect.com/science/journal/00320633/100
http://www.sciencedirect.com/science/journal/00320633/116
http://www.sciencedirect.com/science/journal/00320633/133

IMPORTANT DATES:
30 April 2018, Deadline for Early-Bird Application
13 May 2018, Deadline for Admissions Application
31 May 2018, Notification of Admissions Decision
13–17 August 2018, Cosmic Dust

SCIENTIFIC ORGANIZING COMMITTEE (SOC):
Jean-Charles Augereau (IPAG, France)
Cornelia Jäger (Max Planck Institute for Astronomy, Germany)
Hidehiro Kaneda (Nagoya University, Japan)
Hiroshi Kimura (Chitec/PERC, Japan) [Chair]
Ludmilla Kolokolova (University of Maryland, USA)
Aigen Li (University of Missouri-Columbia, USA)
Takafumi Ootsubo (ISAS/JAXA, Japan)

LOCAL ORGANIZING COMMITTEE (LOC):
Hiroki Chihara (Osaka Sangyo University)
Takayuki Hirai (JAXA/CAC)
Hidehiro Kaneda (Nagoya University)
Hiroshi Kimura (Chitec/PERC)
Hiroshi Kobayashi (Nagoya University)
Takaya Nozawa (National Astronomical Observatory of Japan)
Tomomi Omura (Kobe University)
Takafumi Ootsubo (ISAS/JAXA, Japan) [Chair]
Hiroki Senshu (Chitec/PERC)
Takashi Shimonishi (Tohoku University)
Ryo Tazaki (Tohoku University)
Koji Wada (Chitec/PERC)
Shigeji Wakita (National Astronomical Observatory of Japan)

CONTACT INFORMATION:
dust-inquiries@cps-jp.org
Please mind that any email attachment will be blocked.

BRIEF HISTORY:
The Cosmic Dust meeting started in 2006 as a session called "Cosmic Dust" of the 3rd AOGS (Asia–Oceania Geoscience Society) annual meeting in Singapore. Dust freaks have kept on organizing the session at subsequent AOGS meetings in Korea (2008), India (2010), and Taiwan (2011). The Cosmic Dust series has been recognized as the most successful session of the AOGS Planetary Sciences Section. In 2012, the time was ripe to be free from organizing restrictions on the AOGS meeting. From that time on, the Cosmic Dust meeting is totally independent of any international conference. The past meetings on Cosmic Dust have been held in a relaxed and joyful atmosphere. So will be the coming one!

See also https://www.cps-jp.org/∼dust/